**NARRATOR**
On average a human being produces 500 litres of urine and 50 litres of faeces per year.

This contains enough nutrients to produce the equivalent of 230kg of cereal per year.

Earth Report investigates how our toilets could become a powerful tool for saving water….

The UN designated 2008 as International Year of Sanitation. Yet more than 2.5 billion people worldwide have no proper sanitation.

The UN wants to halve this number within seven years.

Flush toilets and expensive sewer systems are the answer but there’s another, more productive way; ecological sanitation.

The history of using water to flush our human waste dates as far back as Greek and Roman times. Then, public toilets were social places to chat and network.

The modern flush toilet originates from the Elizabethan “water closet”, a British invention.

**Angela Lee, Officer, Gladstone Pottery Museum**
I am sitting on a replica of Sir John Harrington’s flushing water closet.

He is often credited with being the first Englishman to develop a flushing toilet. The toilet we know is an indoor phenomenon so it’s really 20th century new housing that toilets are in homes.

**NARRATOR**
The problem is that a flush toilet uses a lot of water, 27 litres per day.

**Angela Lee**
A newly installed toilet should be flushing about 6 litres on a full flush. Some toilets have an option for a half flush. The situation has improved from that point but certainly we’re still using a lot of water every time we flush.

**NARRATOR**
So conventional sewer systems waste a lot of drinking water and nutrients.

Conserving drinking water is perhaps most urgent in arid regions such as the Arab world. In these dry areas, saving water is vital for survival.

Ahmed Ghrabi and his colleague Latifa Bousselmi of the Water Technology Research Centre in Tunis are searching for ways to save domestic water and re-use human waste.

One idea is to introduce a so-called dry toilet. This toilet uses no water at all for flushing.

The dry toilet collects faeces and urine separately in two compartments – the urine down the small hole and the faeces down the larger.
Fresh urine is a sterile solution. By not mixing the two, the pathogens in the solids cannot contaminate urine. The two products can be treated differently for future re-use. This could help both saving water and stopping wasting our waste.

Ahmed Grabi, Director CERTE
The problem is that we use a lot of water.

There is the agricultural, industrial and urban sector who all use a lot of water. So in the light of that we’re looking at new concepts and technologies, like toilets with double reservoirs and dry toilets.

NARRATOR
Latifa decides to try and introduce the newly arrived dry toilet to some students at the campus of the National Institute of Agronomy.

There’s interest....but also many embarrassed students...

Do the students want to think seriously about using a toilet like this?

Student
I don’t think this fits with our lifestyle, it is not comfortable. Personally I don’t think I would use it.

NARRATOR
Latifa and Ahmed realise it will be difficult to introduce a dry toilet in Tunisia.

They travel to Catania in Italy to meet with European and Mediterranean scientists also searching for sustainable sanitation technologies. There, municipal waste water is biologically treated and cleaned using reed plants.

They meet with Gerd Wach who is based in Germany and developing similar experiments, all based on the so-called ecosanitation principle.

Gerd Wach, Project leader Wassernetz
So I am sitting here on a dry toilet, the dry toilet is the simplest way to close the loop between the nutrients I’m producing and the nutrients which can be used maybe in the garden.

NARRATOR
So ecosanitation closes the ecological loop of nutrients and water use. It actually looks at human waste as a resource rather than something to flush away in a sewer. Waste is not waste. In Germany, thousands of people already use dry toilets.

In Hannover, owners of allotments are very enthusiastic about the dry toilet: they want nutrients for their compost heap.

Helmut Fiene, Allotment Owner
You just need a bucket, you don’t have to buy any chemicals. You just have wood chips mixed in. After six months you have compost which you can put onto your garden.....
Underneath this, the urine is collected....

Our granddaughter often visits. Recently she had a couple of days holidays here with her mum and she said there’s no smell, you don’t feel this is a dry toilet, it’s just like at home...

...so you put the lid back and the toilet is ready for use ...

...to clean you take the bucket out and throw it in your compost heap..

.... you put the bucket here and you empty it....

NARRATOR
Dry toilets may only be used in areas lacking sewage systems. But can a dry toilet work in a modern household?

A normal house in a normal street reveals that a modern household can work perfectly well for ecosanitation.

Sietz Leeflang, has invented and installed two dry composting toilets called “nonolet”.

Sietz Leeflang, Centre for Ecological Techniques
This is the “nonolet”, as we call it, it is a name which is Latin for “no odour”. It is a dry toilet and it is a very small toilet. I can show you the inside if you like there’s a bucket and there is a plastic bag, in which the content of the toilet falls. This is just my toilet as we use it here and you see the paper which is a little bit wet because we always use just one glass of water to put some water accross the paper.

When the toilet is used we simply put a piece of paper in the toilet and we cover and then we use what we call the “press papier” and you press it on the contents of the toilet. And when doing this the oxygen in the paper will kill all bacteria coming from your body. And the smell is away, you have no smell at all and that is the real secret of the nonolet, the “nonolet” toilet.

So this is around a couple of kilos. 3 to 4 weeks of toilet use...

NARRATOR
Every few weeks Sietz takes his waste in the biodegradable bag to his green bin which is taken by the municipal biowaste collection.

His urine goes through the holes in the biodegradable bag and is collected in a separate reservoir.

Sietz Leeflang
So the urine flows through the bag easily with the bit of water that we add and then it can be drained separately.

NARRATOR
He cleans his urine and grey water in a special small scale reed plant filter system. This cleaned water is led to a fish pond in his garden.
A simple dry toilet is some 200 dollars cheaper than the average flush toilet. Money is saved, too, on the water bill plus there’s free compost for the garden.

Throughout Europe more than 20,000 dry toilets are sold each year. So if dry toilets are becoming acceptable in Europe will Ahmed and Latifa successfully introduce them in Tunisia?

So far Ahmed and Latifa have experienced nothing but frustration in their efforts to introduce the dry toilet in Tunisia.

This may be because the flush toilet is a status symbol. Suggesting a dry toilet is like telling people to go backwards...

And most people in the Arab world are washers and not wipers....

It means they need clean water to wash their bottoms....

**Ahmed Ghrabi**

It is not easy for the population to accept something like this. As you know Tunisia is an Arab and Muslim country where the contact with human waste is a taboo, you should not touch it. If you do something with it you should wash yourself and so this, perhaps, is an obstacle for the acceptance of these different solutions....

**NARRATOR**

So a dry toilet doesn’t seem to be a universal option to cut the wastage of nutrients and water.

**Hanouna Hassani, Dormitory Director, Nat. Inst. Agronomy**

So they have explained to me the system. Personally I have strong reservations. To tell me to pick up the bucket and throw it away myself, personally I have reservations (shakes head, appalled)...to take a bucket full of this stuff......that appals me...

**NARRATOR**

A dry toilet is not the only technology for ecosanitation. Ahmed and Latifa will have to look at alternatives.

For example, re-using rainwater. In various villages in southern Tunisia, people have collected rainwater in private cisterns since Roman times.

This rainwater is often used for drinking but also has other uses in the house.

Closer to home, Latifa and Ahmed have found a modern household in Tunis where a man is using his roof to collect rainwater for washing dishes, laundry, irrigating his garden and .......toilet flushing.  

In their search for alternatives, Ahmed and Latifa have also looked at experiments in other North African countries.

In Morocco, Professor Bouchaib el Hamouri uses treated waste water from showers as an alternative for flushing toilets.
Prof. Bouchaib El Hamouri, Hassan II Institute
Here is our grey water treatment system.

Grey water is collected from the ACSA club, and they have a fitness room which receives something like 25 people per session. And we collect the shower water, and pump it to here to be then recycled for toilet flushing....

NARRATOR
Grey water is waste water that comes from the kitchen and bathroom but not from the toilet. The grey water from the showers in Morocco is first cleaned using a reed bed and sand filter. Then it is collected in a reservoir to be disinfected by pumping it through a UV-filter.

Prof. Bouchaib El Hamouri
From the reservoir water is pumped to this unit here which is a UV-light disinfection. And the system is very simple actually, you have water flowing through this teflon tube, and it is surrounded by four UV generating lamps, and bacteria are killed.

NARRATOR
The disinfected water from the showers is then pumped to four experimental toilets. Clean drinking water is still available in these toilets for washing but also in case the grey water runs out.

Prof. Bouchaib El Hamouri
You may see here two entrances, this one is to control the grey water and this one is to control the potable water.

And the main important thing is that, disinfected treated grey water never comes in touch with the entrance of the pipe of the potable water and this is very important....

....this is a particular grey water it is shower grey water, but it is easy to treat it in a system like this.

NARRATOR
Back in Tunisia, encouraged by the success of the Moroccan experiment, Ahmed and Latifa establish their own experiment at a girl’s university dormitory near their office.

Latifa Bousselmi
Here at the university dormitory, we have a communal place for toilets and for showers. This allows us to treat three types of water on this site; the grey water that comes from the showers, the black water that comes from the toilets, and the rainwater that we collect from the roof.

Our objective of this project is to install a shower unit with treated rainwater supply. We have also installed this shower with equipment to reduce the water consumption and maximise the water efficiency.
NARRATOR
The shower water is then treated with a special bioreactor unit and used for flushing toilets. Ahmed and Latifa have just ordered one of these units from Europe. The toilet water is cleaned using a constructed wetland.

Latifa Bousselmi
So it will be used three times and moreover, at the last stage we use all the nutrients like nitrogen and phosphorus in the waste water to irrigate this garden.

NARRATOR
The greywater treatment unit arrives at the office. Now Ahmed and Latifa can finish building their ecosanitation system. The experiment is unique in Tunisia.

Student
Like this there is efficient use of water, it is beneficial for the environment...an excellent project...

Hanouna Hassani
There is some concern about using rainwater for the showers but if it is clear that there is no danger to human health at all, I will personally volunteer to cooperate in using the shower water to flush the toilets and the toilet water for the irrigation....I have no reservations....

NARRATOR
Bouchaib in Morocco is treating black water for irrigating food crops. It’s valuable for agriculture, especially because it contains urine.

Urine is not only sterile, it contains 70% of all the nutrients in our waste.

Back in Tunisia, Ahmed has ordered waterless urinals from Hannover in Germany.

There, waterless urinals are widely used in schools. The urinals use no water for flushing.

Schoolboy
You just do your business and then you go away, there is no water coming out of the urinal. So it’s quite OK you don’t really feel a difference between usual urinals and ours but there is a difference and that’s important.

NARRATOR
A special membrane reduces the smell. Ahmed plans to use them in the primary school in Chorfefch, a village not far from Tunis.

Ahmed Ghrabi
These are the typical urinals of a primary school and this school has been chosen by the Zer0-M project to conduct an experiment of this new approach...
In Chorfefch you will see that the urine is collected separately. As you know urine contains a lot of nitrogen and phosphorus. We can use it directly to fertilise agricultural fields.
NARRATOR
But Ahmed still hasn’t given up on the dry toilet. Whilst in Chorfech, he tries once more to introduce it.

Ahmed visits a sheep farmer, Mohammed bin Ali, who lives close to the school.

Mohammed is not connected to a sewage system. Therefore, he built a cesspit to collect waste....

He is very careful using water...

Mohammed Bin Ali Massaoudi, Sheepfarmer
.... So when someone uses the toilet he washes himself and then fills a bucket and pours it onto the toilet. This saves water. The water from the washing machine we collect in a barrel and use it to wash the floors.....

Also I don’t take a shower directly but use a bucket to wash. I use only one bucket to save both water and money, because the water bill is high so we have to save our water....

NARRATOR
Mohammed’s household would be an excellent candidate to use the first modern dry toilet in Tunisia. So Ahmed and Latifa show him the dry toilet and explain how to use it. Mohammed is full of questions --obviously very interested.

Mohammed Bin Ali Massaoudi
This is much better, all the citizens can follow me and try it themselves.

People will benefit from this and all the nutrients will be of benefit for them.

If we collect our waste and re-use it on the land, the people and farmers who have land here in the neighbourhood will benefit. It will make the land much stronger, you see....

NARRATOR
So finally Ahmed and Latifa found someone willing to use a dry toilet. It means Chorfech will be the first Tunisian village to use modern dry toilets to solve the lack of sanitation, cut water consumption and re-use human waste. Small beginnings. Is there a future for ecosanitation?

Gerd Wach, Project Leader, Wassernetz
When we’re talking about environmental protection, the first step is to think about where are my urine and faeces going? If people are thinking about that, then we are on the right track...

Mohammed Bin Ali
It is all MUCH better!